## SEQUENCE LISTING

| <110>                     | RENARD, MICHEL DELOURME, REGINE BARRET, PIERRE BRUNEL, DOMINIQUE FROGER, NICOLE TANGUY, XAVIER   |   |
|---------------------------|--|---|
| <120>                     | MUTANT GENE OF THE GRAS FAMILY AND PLANTS WITH REDUCED DEVELOPMENT CONTAINING SAID MUTANT GENE   |   |
| <130>                     | 218874US0PCT   |   |
| <140><br><141>            | 10/030,194<br>2002-02-04   |   |
| <150><br><151>            | PCT/FR00/02216<br>2000-08-02   |   |
| <150><br><151>            | ••   |   |
| <160>                     | 7  |   |
| <170>                     | PatentIn version 3.3   |   |
| <210><211><211><212><213> | 1<br>1779<br>DNA<br>Brassica napus   |   |
| <220><br><221><br><222>   | CDS (60)(1778)   |   |
| <400><br>caaccc           | 1<br>agaa caaaaccaga ccgatctgag agattaacta tatcttaacc agatcagaa 59   | ) |
| atg aa<br>Met Ly          | g agg gat ctt cat cag ttc caa ggt ccc aac cac ggg aca tca 107<br>s Arg Asp Leu His Gln Phe Gln Gly Pro Asn His Gly Thr Ser<br>5 10 15  |   |
| atc gc<br>Ile Al          | c ggt tct tcc act tct tcc cct gcg gtg ttt ggt aaa gac aag 155<br>a Gly Ser Ser Thr Ser Ser Pro Ala Val Phe Gly Lys Asp Lys<br>20 25 30 | • |
| atg at<br>Met Me          | g atg gtc aaa gaa gaa gac gac gag ctt cta gga gtc ttg 203<br>t Met Val Lys Glu Glu Glu Asp Asp Glu Leu Leu Gly Val Leu<br>35 40 45     | } |

| ggt<br>Gly        | tac<br>Tyr<br>50  | aag<br>Lys        | gtt<br>Val        | agg<br>Arg        | tct<br>Ser        | tcg<br>Ser<br>55  | gag<br>Glu        | atg<br>Met        | gct<br>Ala        | gag<br>Glu        | gtt<br>Val<br>60  | gcg<br>Ala        | ttg<br>Leu        | aaa<br>Lys        | ctc<br>Leu        | 251 |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----|
| gag<br>Glu<br>65  | cag<br>Gln        | ctt<br>Leu        | gag<br>Glu        | acg<br>Thr        | atg<br>Met<br>70  | atg<br>Met        | ggt<br>Gly        | aac<br>Asn        | gct<br>Ala        | caa<br>Gln<br>75  | gaa<br>Glu        | gac<br>Asp        | ggt<br>Gly        | tta<br>Leu        | gct<br>Ala<br>80  | 299 |
| cac<br>His        | ctc<br>Leu        | gcġ<br>Ala        | acg<br>Thr        | gat<br>Asp<br>85  | act<br>Thr        | gtt<br>Val        | cat<br>His        | tac<br>Tyr        | aac<br>Asn<br>90  | ccc<br>Pro        | gct<br>Ala        | gag<br>Glu        | ctt<br>Leu        | tac<br>Tyr<br>95  | tcg<br>Ser        | 347 |
| tgg<br>Trp        | ctt<br>Leu        | gat<br>Asp        | aac<br>Asn<br>100 | atg<br>Met        | ctc<br>Leu        | acg<br>Thr        | gag<br>Glu        | ctt<br>Leu<br>105 | aac<br>Asn        | cca<br>Pro        | ccc<br>Pro        | gct<br>Ala        | gca<br>Ala<br>110 | acg<br>Thr        | acc<br>Thr        | 395 |
| gga<br>Gly        | tct<br>Ser        | aac<br>Asn<br>115 | gct<br>Ala        | ttg<br>Leu        | aac<br>Asn        | ccg<br>Pro        | gag<br>Glu<br>120 | att<br>Ile        | aat<br>Asn        | aat<br>Asn        | aat<br>Asn        | aat<br>Asn<br>125 | aat<br>Asn        | aac<br>Asn        | tcg<br>Ser        | 443 |
| ttt<br>Phe        | ttc<br>Phe<br>130 | acc<br>Thr        | gga<br>Gly        | ggc<br>Gly        | gac<br>Asp        | ctc<br>Leu<br>135 | aaa<br>Lys        | gcg<br>Ala        | att<br>Ile        | cct<br>Pro        | gga<br>Gly<br>140 | aac<br>Asn        | gcg<br>Ala        | gtt<br>Val        | tgt<br>Cys        | 491 |
| cgc<br>Arg<br>145 | aga<br>Arg        | tct<br>Ser        | aat<br>Asn        | cag<br>Gln        | ttc<br>Phe<br>150 | gcg<br>Ala        | ttt<br>Phe        | gcg<br>Ala        | gtt<br>Val        | gat<br>Asp<br>155 | tcg<br>Ser        | tcg<br>Ser        | agt<br>Ser        | aat<br>Asn        | aag<br>Lys<br>160 | 539 |
| cgt<br>Arg        | ttg<br>Leu        | aaa<br>Lys        | ccg<br>Pro        | tcc<br>Ser<br>165 | tcg<br>Ser        | agc<br>Ser        | cct<br>Pro        | gat<br>Asp        | tcg<br>Ser<br>170 | atg<br>Met        | gtt<br>Val        | aca<br>Thr        | tct<br>Ser        | cca<br>Pro<br>175 | tca<br>Ser        | 587 |
| cct<br>Pro        | gct<br>Ala        | gga<br>Gly        | gtt<br>Val<br>180 | ata<br>Ile        | gga<br>Gly        | Thr               | Thr               | gtt<br>Val<br>185 | Thr               | Thr               | Val               | Thr               | Glu               | Ser               | act<br>Thr        | 635 |
| cgt<br>Arg        | cct<br>Pro        | tta<br>Leu<br>195 | atc<br>Ile        | ctg<br>Leu        | gtc<br>Val        | gac<br>Asp        | tcg<br>Ser<br>200 | cag<br>Gln        | gac<br>Asp        | aac<br>Asn        | gga<br>Gly        | gtg<br>Val<br>205 | cgt<br>Arg        | cta<br>Leu        | gtc<br>Val        | 683 |
| cac<br>His        | gcg<br>Ala<br>210 | ctt<br>Leu        | atg<br>Met        | gcc<br>Ala        | tgc<br>Cys        | gct<br>Ala<br>215 | gaa<br>Glu        | gcc<br>Ala        | gtg<br>Val        | Gln               | agc<br>Ser<br>220 | agc<br>Ser        | aac<br>Asn        | ttg<br>Leu        | act<br>Thr        | 731 |
| cta<br>Leu<br>225 | gcg<br>Ala        | gag<br>Glu        | gct<br>Ala        | ctc<br>Leu        | gtt<br>Val<br>230 | aag<br>Lys        | cag<br>Gln        | att<br>Ile        | ggt<br>Gly        | ttc<br>Phe<br>235 | ttg<br>Leu        | gcc<br>Ala        | gtc<br>Val        | tct<br>Ser        | caa<br>Gln<br>240 | 779 |
| gcc<br>Ala        | gga<br>Gly        | gcc<br>Ala        | atg<br>Met        | agg<br>Arg        | aaa<br>Lys        | gtc<br>Val        | gcc<br>Ala        | acg<br>Thr        | tac<br>Tyr        | ttc<br>Phe        | gcc<br>Ala        | gaa<br>Glu        | gct<br>Ala        | ctc<br>Leu        | gcg<br>Ala        | 827 |

| cgg<br>Arg        | agg<br>Arg        | atc<br>Ile        | tac<br>Tyr<br>260 | cgc<br>Arg        | ctc<br>Leu        | tct<br>Ser        | ccg<br>Pro        | ccg<br>Pro<br>265 | cag<br>Gln        | acg<br>Thr        | cag<br>Gln        | atc<br>Ile        | gat<br>Asp<br>270 | cac<br>His        | tct<br>Ser        | .875 |  |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|--|
| tta<br>Leu        | tcc<br>Ser        | gat<br>Asp<br>275 | act<br>Thr        | ctc<br>Leu        | cag<br>Gln        | atg<br>Met        | cac<br>His<br>280 | ttc<br>Phe        | tac<br>Tyr        | gag<br>Glu        | act<br>Thr        | tgc<br>Cys<br>285 | cct<br>Pro        | tac<br>Tyr        | ctc<br>Leu        | 923  |  |
| aag<br>Lys        | ttc<br>Phe<br>290 | gct<br>Ala        | cac<br>His        | ttc<br>Phe        | acg<br>Thr        | gcg<br>Ala<br>295 | aat<br>Asn        | cag<br>Gln        | gcg<br>Ala        | att<br>Ile        | ctc<br>Leu<br>300 | gag<br>Glu        | gct<br>Ala        | ttc<br>Phe        | gaa<br>Glu        | 971  |  |
| ggg<br>Gly<br>305 | aag<br>Lys        | aag<br>Lys        | aga<br>Arg        | gtc<br>Val        | cac<br>His<br>310 | gtc<br>Val        | atc<br>Ile        | gat<br>Asp        | ttc<br>Phe        | tcg<br>Ser<br>315 | atg<br>Met        | aac<br>Asn        | caa<br>Gln        | ggg<br>Gly        | ctt<br>Leu<br>320 | 1019 |  |
| cag<br>Gln        | tgg<br>Trp        | ccc<br>Pro        | gcg<br>Ala        | ctt<br>Leu<br>325 | atg<br>Met        | caa<br>Gln        | gcc<br>Ala        | ctt<br>Leu        | gcg<br>Ala<br>330 | ttg<br>Leu        | agg<br>Arg        | gaa<br>Glu        | gga<br>Gly        | ggt<br>Gly<br>335 | cct<br>Pro        | 1067 |  |
| ccg<br>Pro        | agt<br>Ser        | ttc<br>Phe        | agg<br>Arg<br>340 | tta<br>Leu        | acc<br>Thr        | gga<br>Gly        | att<br>Ile        | ggt<br>Gly<br>345 | cct<br>Pro        | ccc<br>Pro        | gcg<br>Ala        | gcg<br>Ala        | gat<br>Asp<br>350 | aac<br>Asn        | tcc<br>Ser        | 1115 |  |
| gat<br>Asp        | cat<br>His        | ctc<br>Leu<br>355 | cat<br>His        | gaa<br>Glu        | gtt<br>Val        | gga<br>Gly        | tgt<br>Cys<br>360 | aag<br>Lys        | ttg<br>Leu        | gct<br>Ala        | cag<br>Gln        | ctc<br>Leu<br>365 | gcg<br>Ala        | gag<br>Glu        | gcg<br>Ala        | 1163 |  |
| att<br>Ile        | cac<br>His<br>370 | gtc<br>Val        | gag<br>Glu        | ttt<br>Phe        | gag<br>Glu        | tat<br>Tyr<br>375 | cgt<br>Arg        | ggc<br>Gly        | ttt<br>Phe        | gtt<br>Val        | gct<br>Ala<br>380 | aat<br>Asn        | agc<br>Ser        | tta<br>Leu        | gct<br>Ala        | 1211 |  |
| Asp               | ctt<br>Leu        | Asp               | Ala               | tcg<br>Ser        | Met               | ctt<br>Leu        | Glu               | Leu               | Arg               | Pro               | Ser               | Glu               | Thr               | gaa<br>Glu        | gct<br>Ala<br>400 | 1259 |  |
| gtg<br>Val        | gcg<br>Ala        | gtt<br>Val        | aac<br>Asn        | tct<br>Ser<br>405 | gtt<br>Val        | ttc<br>Phe        | gag<br>Glu        | ctc<br>Leu        | cac<br>His<br>410 | aag<br>Lys        | ctc<br>Leu        | cta<br>Leu        | ggc<br>Gly        | cgt<br>Arg<br>415 | acc<br>Thr        | 1307 |  |
| ggt<br>Gly        | ggg<br>Gly        | ata<br>Ile        | gag<br>Glu<br>420 | aaa<br>Lys        | gtc<br>Val        | ttc<br>Phe        | ggc<br>Gly        | gtt<br>Val<br>425 | gtg<br>Val        | aaa<br>Lys        | cag<br>Gln        | att<br>Ile        | aaa<br>Lys<br>430 | ccg<br>Pro        | gtg<br>Val        | 1355 |  |
| att<br>Ile        | ttc<br>Phe        | acg<br>Thr<br>435 | gtt<br>Val        | gtt<br>Val        | gag<br>Glu        | caa<br>Gln        | gaa<br>Glu<br>440 | tcg<br>Ser        | aat<br>Asn        | cat<br>His        | Asn               | ggt<br>Gly<br>445 | ccg<br>Pro        | gtt<br>Val        | ttc<br>Phe        | 1403 |  |
| tta               | gac               | cgg               | ttt.              | act               | gaa               | tcg               | ctg               | cat               | tat               | tat               | tcg               | acg               | ttg               | ttt               | gat               | 1451 |  |

|                              | ٠                 |                          |                   |                   |                   |                   |                   | t                 | :                 | •                 |                   |                   |                   |                   |                   |      |
|------------------------------|-------------------|--------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| Leu                          | Asp<br>450        | Arg                      | Phe               | Thr               | Glu               | Ser<br>455        | Leu               | His               | Tyr               | Tyr               | Ser<br>460        | Thr               | Leu               | Phe               | Asp               |      |
| tcc<br>Ser<br>465            | ttg<br>Leu        | gaa<br>Glu               | ggt<br>Gly        | gct<br>Ala        | ccg<br>Pro<br>470 | agt<br>Ser        | agc<br>Ser        | caa<br>Gln        | gat<br>Asp        | aaa<br>Lys<br>475 | gtt<br>Val        | atg<br>Met        | tcg<br>Ser        | gaa<br>Glu        | gtt<br>Val<br>480 | 1499 |
| tat<br>Tyr                   | tta<br>Leu        | ggg<br>Gly               | aaa<br>Lys        | cag<br>Gln<br>485 | att<br>Ile        | tgc<br>Cys        | aat<br>Asn        | ctg<br>Leu        | gtg<br>Val<br>490 | gct<br>Ala        | tgc<br>Cys        | gaa<br>Glu        | ggt<br>Gly        | ccg<br>Pro<br>495 | gac<br>Asp        | 1547 |
| cgt<br>Arg                   | gtt<br>Val        | gag<br>Glu               | aga<br>Arg<br>500 | cat<br>His        | gag<br>Glu        | acg<br>Thr        | ctg<br>Leu        | agt<br>Ser<br>505 | caa<br>Gln        | tgg<br>Trp        | tcg<br>Ser        | aac<br>Asn        | cgg<br>Arg<br>510 | ttc<br>Phe        | ggt<br>Gly        | 1595 |
| tcg<br>Ser                   | tcc<br>Ser        | ggt<br>Gly<br>515        | ttt<br>Phe        | gcg<br>Ala        | ccg<br>Pro        | gcg<br>Ala        | cat<br>His<br>520 | ctc<br>Leu        | ggg<br>ggg        | tct<br>Ser        | aac<br>Asn        | gcg<br>Ala<br>525 | ttt<br>Phe        | aag<br>Lys        | caa<br>Gln        | 1643 |
| gcg<br>Ala                   | agt<br>Ser<br>530 | acg<br>Thr               | ctt<br>Leu        | ttg<br>Leu        | gct<br>Ala        | ttg<br>Leu<br>535 | ttt<br>Phe        | aat<br>Asn        | gga<br>Gly        | ggc<br>Gly        | gaa<br>Glu<br>540 | ggt<br>Gly        | tat<br>Tyr        | cgt<br>Arg        | gtg<br>Val        | 1691 |
| gag<br>Glu<br>545            | gag<br>Glu        | aat<br>Asn               | aat<br>Asn        | ggg<br>Gly        | tgt<br>Cys<br>550 | ttg<br>Leu        | atg<br>Met        | ttg<br>Leu        | agt<br>Ser        | tgg<br>Trp<br>555 | cac<br>His        | act<br>Thr        | cga<br>Arg        | ccg<br>Pro        | ctc<br>Leu<br>560 | 1739 |
| ata<br>Ile                   | acc<br>Thr        | Thr                      | Ser               | gct<br>Ala<br>565 | Trp               | Lys               | Leu               | Ser               | gcg<br>Ala<br>570 | Val               | cac<br>His        | tga<br>-          | g                 |                   |                   | 1779 |
| <210<br><211<br><212<br><213 | L> 5<br>2> I      | 2<br>572<br>PRT<br>Brass | sica              | napı              | 15                |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |      |
| <400                         | 0> 2              | 2                        |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |      |
| Met<br>1                     | Lys               | Arg                      | Asp               | Leu<br>5          | His               | Gln               | Phe               | Gln               | Gly<br>10         | Pro               | Asn               | His               | Gly               | Thr<br>15         | Ser               |      |
| Ile                          | Ala               | Gly                      | Ser<br>20         | Ser               | Thr               | Ser               | Ser               | Pro               | Ala               | Val               | Phe               | Gly               | Lys<br>30         | Asp               | Lys               |      |
| Met                          | Met               | Met<br>35                | Val               | Lys               | Glu               | Glu               | Glu<br>40         | Asp               | Asp               | Glu               | Leu               | Leu<br>45         | Gly               | Val               | Leu               |      |

Gly Tyr Lys Val Arg Ser Ser Glu Met Ala Glu Val Ala Leu Lys Leu Glu Gln Leu Glu Thr Met Met Gly Asn Ala Gln Glu Asp Gly Leu Ala His Leu Ala Thr Asp Thr Val His Tyr Asn Pro Ala Glu Leu Tyr Ser Trp Leu Asp Asn Met Leu Thr Glu Leu Asn Pro Pro Ala Ala Thr Thr Gly Ser Asn Ala Leu Asn Pro Glu Ile Asn Asn Asn Asn Asn Asn Ser Phe Phe Thr Gly Gly Asp Leu Lys Ala Ile Pro Gly Asn Ala Val Cys Arg Arg Ser Asn Gln Phe Ala Phe Ala Val Asp Ser Ser Asn Lys Arg Leu Lys Pro Ser Ser Ser Pro Asp Ser Met Val Thr Ser Pro Ser Pro Ala Gly Val Ile Gly Thr Thr Val Thr Thr Val Thr Glu Ser Thr Arg Pro Leu Ile Leu Val Asp Ser Gln Asp Asn Gly Val Arg Leu Val His Ala Leu Met Ala Cys Ala Glu Ala Val Gln Ser Ser Asn Leu Thr -220 Leu Ala Glu Ala Leu Val Lys Gln Ile Gly Phe Leu Ala Val Ser Gln Ala Gly Ala Met Arg Lys Val Ala Thr Tyr Phe Ala Glu Ala Leu Ala 

Arg Arg Ile Tyr Arg Leu Ser Pro Pro Gln Thr Gln Ile Asp His Ser Leu Ser Asp Thr Leu Gln Met His Phe Tyr Glu Thr Cys Pro Tyr Leu Lys Phe Ala His Phe Thr Ala Asn Gln Ala Ile Leu Glu Ala Phe Glu Gly Lys Lys Arg Val His Val Ile Asp Phe Ser Met Asn Gln Gly Leu Gln Trp Pro Ala Leu Met Gln Ala Leu Ala Leu Arg Glu Gly Gly Pro Pro Ser Phe Arg Leu Thr Gly Ile Gly Pro Pro Ala Ala Asp Asn Ser Asp His Leu His Glu Val Gly Cys Lys Leu Ala Gln Leu Ala Glu Ala Ile His Val Glu Phe Glu Tyr Arg Gly Phe Val Ala Asn Ser Leu Ala Asp Leu Asp Ala Ser Met Leu Glu Leu Arg Pro Ser Glu Thr Glu Ala Val Ala Val Asn Ser Val Phe Glu Leu His Lys Leu Leu Gly Arg Thr Gly Gly Ile Glu Lys Val Phe Gly Val Val Lys Gln Ile Lys Pro Val Ile Phe Thr Val Val Glu Gln Glu Ser Asn His Asn Gly Pro Val Phe Leu Asp Arg Phe Thr Glu Ser Leu His Tyr Tyr Ser Thr Leu Phe Asp 

| Ser<br>465                   | Leu          | Glu                       | Gly              | Ala             | Pro<br>470 | Ser        | Ser        | Gln              | Asp              | Lys<br>475   | Val        | Met        | Ser              | Glu              | Val<br>480 |     |
|------------------------------|--------------|---------------------------|------------------|-----------------|------------|------------|------------|------------------|------------------|--------------|------------|------------|------------------|------------------|------------|-----|
| Tyr                          | Leu          | Gly                       | Lys              | Gln<br>485      | Ile        | Cys        | Asn        | Leu              | Val<br>490       | Ala          | Cys        | Glu        | Gly              | Pro<br>495       | Asp        |     |
| Arg                          | Val          | Glu                       | Arg<br>500       | His             | Glu        | Thr        | Leu        | Ser<br>505       | Gln              | Trp          | Ser        | Asn        | Arg<br>510       | Phe              | Gly        |     |
| Ser                          | Ser          | Gly<br>515                | Phe              | Ala             | Pro        | Ala        | His<br>520 | Leu              | Gly              | Ser          | Asn        | Ala<br>525 | Phe              | Lys              | Gln        |     |
| Ala                          | Ser<br>530   | Thr                       | Leu              | Leu             | Ala        | Leu<br>535 | Phe        | Asn              | Gly              | Gly          | Glu<br>540 | Gly        | Tyr              | Arg              | Val        |     |
| Glu<br>545                   | Glu          | Asn                       | Asn              | Gly             | Cys<br>550 | Leu        | Met        | Leu              | Ser              | Trp<br>555   | His        | Thr        | Arg              | Pro              | Leu<br>560 |     |
| Ile                          | Thr          | Thr                       | Ser              | Ala<br>565      | Trp        | Lys        | Leu        | Ser              | Ala<br>570       | Val          | His        |            |                  |                  |            |     |
| <210<br><211<br><212<br><213 | L> :<br>2> I | 3<br>1779<br>DNA<br>3rass | sica             | napı            | ıs         |            |            |                  |                  |              |            |            |                  |                  |            |     |
| <220<br><221<br><222         | L> (         | CDS<br>(60)               | (1               | 778)            |            |            |            |                  |                  | ·            |            |            |                  |                  |            |     |
| <400<br>caa                  | )> (         | 3<br>gaa d                | caaaa            | accaç           | ga co      | cgato      | ctga       | g ag             | atta             | act <u>a</u> | tat        | ctta       | acc ·            | agat             | cagaa      | 59  |
| atg<br>Met<br>1              | aag<br>Lys   | agg<br>Arg                | gat<br>Asp       | ctt<br>Leu<br>5 | cat<br>His | cag<br>Gln | ttc<br>Phe | caa<br>Gln       | ggt<br>Gly<br>10 | ccc<br>Pro   | aac<br>Asn | cac<br>His | ggg              | aca<br>Thr<br>15 | tca<br>Ser | 107 |
| atc<br>Ile                   | gcc<br>Ala   | ggt<br>Gly                | tct<br>Ser<br>20 | tcc<br>Ser      | act<br>Thr | tct<br>Ser | tcc<br>Ser | cct<br>Pro<br>25 | gcg<br>Ala       | gtg<br>Val   | ttt<br>Phe | ggt<br>Gly | aaa<br>Lys<br>30 | gac<br>Asp       | aag<br>Lys | 155 |

| atg<br>Met        | atg<br>Met        | atg<br>Met<br>35  | gtc<br>Val        | aaa<br>Lys       | gaa<br>Glu        | gaa<br>Glu        | gaa<br>Glu<br>40  | gac<br>Asp        | gac<br>Asp       | gag<br>Glu        | ctt<br>Leu        | cta<br>Leu<br>45  | gga<br>Gly        | gtc<br>Val        | ttg<br>Leu        | 203 |
|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----|
| ggt<br>Gly        | tac<br>Tyr<br>50  | aag<br>Lys        | gtt<br>Val        | agg<br>Arg       | tct<br>Ser        | tcg<br>Ser<br>55  | gag<br>Glu        | atg<br>Met        | gct<br>Ala       | gag<br>Glu        | gtt<br>Val<br>60  | gcg<br>Ala        | ttg<br>Leu        | aaa<br>Lys        | ctc<br>Leu        | 251 |
| gag<br>Glu<br>65  | cag<br>Gln        | ctt<br>Leu        | gag<br>Glu        | acg<br>Thr       | atg<br>Met<br>70  | atg<br>Met        | ggt<br>Gly        | aac<br>Asn        | gct<br>Ala       | caa<br>Gln<br>75  | gaa<br>Glu        | gac<br>Asp        | ggt<br>Gly        | tta<br>Leu        | gct<br>Ala<br>80  | 299 |
| cac<br>His        | ctc<br>Leu        | gcg<br>Ala        | acg<br>Thr        | gat<br>Asp<br>85 | act<br>Thr        | gtt<br>Val        | cat<br>His        | tac<br>Tyr        | aac<br>Asn<br>90 | ccc<br>Pro        | gct<br>Ala        | gag<br>Glu        | ctt<br>Leu        | tac<br>Tyr<br>95  | tcg<br>Ser        | 347 |
| tgg<br>Trp        | ctt<br>Leu        | gat<br>Asp        | aac<br>Asn<br>100 | atg<br>Met       | ctc<br>Leu        | acg<br>Thr        | gag<br>Glu        | ctt<br>Leu<br>105 | aac<br>Asn       | cca<br>Pro        | ccc<br>Pro        | gct<br>Ala        | gca<br>Ala<br>110 | acg<br>Thr        | acc<br>Thr        | 395 |
| gga<br>Gly        | tct<br>Ser        | aac<br>Asn<br>115 | gct<br>Ala        | ttg<br>Leu       | aac<br>Asn        | ccg<br>Pro        | gag<br>Glu<br>120 | att<br>Ile        | aat<br>Asn       | aat<br>Asn        | aat<br>Asn        | aat<br>Asn<br>125 | aat<br>Asn        | aac<br>Asn        | tcg<br>Ser        | 443 |
| ttt<br>Phe        | ttc<br>Phe<br>130 | acc<br>Thr        | gga<br>Gly        | ggc<br>Gly       | gac<br>Asp        | ctc<br>Leu<br>135 | aaa<br>Lys        | gcg<br>Ala        | att<br>Ile       | cct<br>Pro        | gga<br>Gly<br>140 | aac<br>Asn        | gcg<br>Ala        | gtt<br>Val        | tgt<br>Cys        | 491 |
| cgc<br>Arg<br>145 | aga<br>Arg        | tct<br>Ser        | aat<br>Asn        | cag<br>Gln       | ttc<br>Phe<br>150 | gcg<br>Ala        | ttt<br>Phe        | gcg<br>Ala        | gtt<br>Val       | gat<br>Asp<br>155 | tcg<br>Ser        | tcg<br>Ser        | agt<br>Ser        | aat<br>Asn        | aag<br>Lys<br>160 | 539 |
| cgt<br>Arg        | ttg<br>Leu        | Lys               | Pro               | Ser              | Ser               | agc<br>Ser        | Pro               | Asp               | Ser              | Met               | Val               | Thr               | Ser               | cca<br>Pro<br>175 | tca<br>Ser        | 587 |
| cct<br>Pro        | gct<br>Ala        | gga<br>Gly        | gtt<br>Val<br>180 | ata<br>Ile       | gga<br>Gly        | acg<br>Thr        | acg<br>Thr        | gtt<br>Val<br>185 | aca<br>Thr       | acc<br>Thr        | gtg<br>Val        | acc<br>Thr        | gag<br>Glu<br>190 | tca<br>Ser        | act<br>Thr        | 635 |
| cgt<br>Arg        | cct<br>Pro        | tta<br>Leu<br>195 | atc<br>Ile        | ctg<br>Leu       | gtc<br>Val        | gac<br>Asp        | tcg<br>Ser<br>200 | cag<br>Gln        | gac<br>Asp       | aac<br>Asn        | gga<br>Gly        | gtg<br>Val<br>205 | cgt<br>Arg        | cta<br>Leu        | gtc<br>Val        | 683 |
| cac               | gcg<br>Ala<br>210 | ctt<br>Leu        | atg<br>Met        | gcc<br>Ala       | tgc<br>Cys        | gct<br>Ala<br>215 | gaa<br>Glu        | gcc<br>Ala        | gtg<br>Val       | cag<br>Gln        | agc<br>Ser<br>220 | agc<br>Ser        | aac<br>Asn        | ttg<br>Leu        | act<br>Thr        | 731 |
| cta<br>Leu<br>225 | gcg<br>Ala        | gag<br>Glu        | gct<br>Ala        | ctc<br>Leu       | gtt<br>Val<br>230 | aag<br>Lys        | cag<br>Gln        | att<br>Ile        | ggt<br>Gly       | ttc<br>Phe<br>235 | ttg<br>Leu        | gcc<br>Ala        | gtc<br>Val        | tct<br>Ser        | caa<br>Gln<br>240 | 779 |

|                        |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   |                   | •                 |                   |                   |      |
|------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| gcc<br>Ala             | gga<br>Gly        | gcc<br>Ala        | atg<br>Met        | agg<br>Arg<br>245 | aaa<br>Lys        | gtc<br>Val        | gcc<br>Ala        | acg<br>Thr        | tac<br>Tyr<br>250 | ttc<br>Phe        | gcc<br>Ala        | gaa<br>Glu        | Ala               | ctc<br>Leu<br>255 | gcg<br>Ala        | 827  |
| cgg<br>Arg             | agg<br>Arg        | atc<br>Ile        | tac<br>Tyr<br>260 | cgc<br>Arg        | ctc<br>Leu        | tct<br>Ser        | ccg<br>Pro        | ccg<br>Pro<br>265 | cag<br>Gln        | acg<br>Thr        | cag<br>Gln        | atc<br>Ile        | gat<br>Asp<br>270 | cac<br>His        | tct<br>Ser        | 875  |
| tta<br>Leu             | tcc<br>Ser        | gat<br>Asp<br>275 | act<br>Thr        | ctc<br>Leu        | cag<br>Gln        | atg<br>Met        | cac<br>His<br>280 | ttc<br>Phe        | tac<br>Tyr        | gag<br>Glu        | act<br>Thr        | tgc<br>Cys<br>285 | cct<br>Pro        | tac<br>Tyr        | ctc<br>Leu        | 923  |
| aag<br>Lys             | ttc<br>Phe<br>290 | gct<br>Ala        | cac<br>His        | ttc<br>Phe        | acg<br>Thr        | gcg<br>Ala<br>295 | aat<br>Asn        | cag               | gcg<br>Ala        | att<br>Ile        | ctc<br>Leu<br>300 | gag<br>Glu        | gct<br>Ala        | ttc<br>Phe        | gaa<br>Glu        | 971  |
| ggg<br>Gly<br>305      | aag<br>Lys        | aag<br>Lys        | aga<br>Arg        | gtc<br>Val        | cac<br>His<br>310 | gtc<br>Val        | atc<br>Ile        | gat<br>Asp        | ttc<br>Phe        | tcg<br>Ser<br>315 | atg<br>Met        | aac<br>Asn        | caa<br>Gln        | ggg               | ctt<br>Leu<br>320 | 1019 |
| caç<br>Glr             | tgg<br>Trp        | ccc<br>Pro        | gcg<br>Ala        | ctt<br>Leu<br>325 | atg<br>Met        | caa<br>Gln        | gcc<br>Ala        | ctt<br>Leu        | gcg<br>Ala<br>330 | ttg<br>Leu        | agg<br>Arg        | gaa<br>Glu        | gga<br>Gly        | ggt<br>Gly<br>335 | cct<br>Pro        | 1067 |
| ccç                    | agt<br>Ser        | ttc<br>Phe        | agg<br>Arg<br>340 | tta<br>Leu        | acc<br>Thr        | gga<br>Gly        | att<br>Ile        | ggt<br>Gly<br>345 | cct<br>Pro        | ccc<br>Pro        | gcg<br>Ala        | gcg<br>Ala        | gat<br>Asp<br>350 | aac<br>Asn        | tcc<br>Ser        | 1115 |
| gat<br>Asp             | cat<br>His        | ctc<br>Leu<br>355 | cat<br>His        | gaa<br>Glu        | gtt<br>Val        | gga<br>Gly        | tgt<br>Cys<br>360 | aag<br>Lys        | ttg<br>Leu        | gct<br>Ala        | cag<br>Gln        | ctc<br>Leu<br>365 | gcg<br>Ala        | gag<br>Glu        | gcg<br>Ala        | 1163 |
| att<br>Ile             | cac<br>His<br>370 | gtc<br>Val        | gag<br>Glu        | ttt<br>Phe        | Glu               | tat<br>Tyr<br>375 | Arg               | Gly               | Phe               | Val               | gct<br>Ala<br>380 | Asn               | agc<br>Ser        | tta<br>Leu        | gct<br>Ala        | 1211 |
| gat<br>Asp<br>385      | ctt<br>Leu        | gat<br>Asp        | gcc<br>Ala        | tcg<br>Ser        | atg<br>Met<br>390 | ctt<br>Leu        | gag<br>Glu        | ctt<br>Leu        | aga<br>Arg        | ccg<br>Pro<br>395 | agt<br>Ser        | gaa<br>Glu        | acc<br>Thr        | gaa<br>Glu        | gct<br>Ala<br>400 | 1259 |
| gto<br>Val             | gcg<br>Ala        | gtt<br>Val        | aac<br>Asn        | tct<br>Ser<br>405 | gtt<br>Val        | ttc<br>Phe        | gag<br>Glu        | ctc<br>Leu        | cac<br>His<br>410 | aag<br>Lys        | ctc<br>Leu        | cta<br>Leu        | ggc               | cgt<br>Arg<br>415 | acc<br>Thr        | 130  |
| ggt<br>Gl <sub>y</sub> | ggg<br>Gly        | ata<br>Ile        | gag<br>Glu<br>420 | aaa<br>Lys        | gtc<br>Val        | ttc<br>Phe        | ggc<br>Gly        | gtt<br>Val<br>425 | gtg<br>Val        | aaa<br>Lys        | cag<br>Gln        | att<br>Ile        | aaa<br>Lys<br>430 | Pro               | gtg<br>Val        | 1355 |
| att<br>Ile             | ttc<br>Phe        | acg<br>Thr        | gtt<br>Val        | gtt<br>Val        | gag<br>Glu        | caa<br>Gln        | gaa<br>Glu        | tcg<br>Ser        | aat<br>Asn        | cat<br>His        | aac<br>Asn        | ggt<br>Gly        | ccg               | gtt<br>Val        | ttc<br>Phe        | 1403 |

435 440 445

| tta<br>Leu        | gac<br>Asp<br>450 | cgg<br>Arg        | ttt<br>Phe        | act<br>Thr        | gaa<br>Glu        | tcg<br>Ser<br>455 | ctg<br>Leu        | cat<br>His        | tat<br>Tyr        | tat<br>Tyr        | tcg<br>Ser<br>460 | acg<br>Thr        | ttg<br>Leu        | ttt<br>Phe        | gat<br>Asp        | 1451 |
|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------|
| tcc<br>Ser<br>465 | ttg<br>Leu        | gaa<br>Glu        | ggt<br>Gly        | gct<br>Ala        | ccg<br>Pro<br>470 | agt<br>Ser        | agc<br>Ser        | caa<br>Gln        | gat<br>Asp        | aaa<br>Lys<br>475 | gtt<br>Val        | atg<br>Met        | tcg<br>Ser        | gaa<br>Glu        | gtt<br>Val<br>480 | 1499 |
| tat<br>Tyr        | tta<br>Leu        | Gly               | aaa<br>Lys        | cag<br>Gln<br>485 | att<br>Ile        | tgc<br>Cys        | aat<br>Asn        | ctg<br>Leu        | gtg<br>Val<br>490 | gct<br>Ala        | tgc<br>Cys        | gaa<br>Glu        | ggt<br>Gly        | ccg<br>Pro<br>495 | gac<br>Asp        | 1547 |
| cgt<br>Arg        | gtt<br>Val        | gag<br>Glu        | aga<br>Arg<br>500 | cat<br>His        | gag<br>Glu        | acg<br>Thr        | ctg<br>Leu        | agt<br>Ser<br>505 | caa<br>Gln        | tgg<br>Trp        | tcg<br>Ser        | aac<br>Asn        | cgg<br>Arg<br>510 | ttc<br>Phe        | ggt<br>Gly        | 1595 |
| tcg<br>Ser        | tcc<br>Ser        | ggt<br>Gly<br>515 | ttt<br>Phe        | gcg<br>Ala        | ccg<br>Pro        | gcg<br>Ala        | cat<br>His<br>520 | ctc<br>Leu        | ggg<br>Gly        | tct<br>Ser        | aac<br>Asn        | gcg<br>Ala<br>525 | ttt<br>Phe        | aag<br>Lys        | caa<br>Gln        | 1643 |
| gcg<br>Ala        | agt<br>Ser<br>530 | acg<br>Thr        | ctt<br>Leu        | ttg<br>Leu        | gct<br>Ala        | ttg<br>Leu<br>535 | ttt<br>Phe        | aat<br>Asn        | gga<br>Gly        | ggc<br>Gly        | gaa<br>Glu<br>540 | ggt<br>Gly        | tat<br>Tyr        | cgt<br>Arg        | gtg<br>Val        | 1691 |
| gag<br>Glu<br>545 | aag<br>Lys        | aat<br>Asn        | aat<br>Asn        | ggg<br>Gly        | tgt<br>Cys<br>550 | ttg<br>Leu        | atg<br>Met        | ttg<br>Leu        | agt<br>Ser        | tgg<br>Trp<br>555 | cac<br>His        | act<br>Thr        | cga<br>Arg        | ccg<br>Pro        | ctc<br>Leu<br>560 | 1739 |
|                   |                   |                   |                   |                   | tgg<br>Trp        |                   |                   |                   |                   |                   |                   | tga               | g                 |                   |                   | 1779 |

<210> 4

<211> 572

<212> PRT

<213> Brassica napus

<400> .4

Met Lys Arg Asp Leu His Gln Phe Gln Gly Pro Asn His Gly Thr Ser  $1 \hspace{1cm} 5 \hspace{1cm} 10 \hspace{1cm} 15$ 

Ile Ala Gly Ser Ser Thr Ser Ser Pro Ala Val Phe Gly Lys Asp Lys 20 25 30

Met Met Met Val Lys Glu Glu Glu Asp Asp Glu Leu Leu Gly Val Leu

| Gly        | Tyr<br>50  | Lys        | Val        | Arg        | Ser        | Ser<br>55  | Glu        | Met        | Ala        | Glu        | Val<br>60  | Ala        | Leu        | Lys         | Leu        |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|-------------|------------|
| Glu<br>65  | Gln        | Leu        | Glu        | Thr        | Met<br>70  | Met        | Gly        | Asn        | Ala        | Gln<br>75  | Glu        | Asp        | Gly        | Leu         | Ala<br>80  |
| His        | Leu        | Ala        | Thr        | Asp<br>85  | Thr        | Val        | His        | Tyr        | Asn<br>90  | Pro        | Ala        | Glu        | Leu        | Tyr<br>95   | Ser        |
| Trp        | Leu        | Asp        | Asn<br>100 | Met        | Leu        | Thr        | Glu        | Leu<br>105 | Asn        | Pro        | Pro        | Ala        | Ala<br>110 | Thr         | Thr        |
| Gly        | Ser        | Asn<br>115 | Ala        | Leu        | Asn        | Pro        | Glu<br>120 | Ile        | Asn        | Asn        | Asn        | Asn<br>125 | Asn        | Asn         | Ser        |
| Phe        | Phe<br>130 | Thr        | Gly        | Gly        | Asp        | Leu<br>135 | Lys        | Ala        | Ile        | Pro        | Gly<br>140 | .Asn       | Ala        | Val         | Cys        |
| Arg<br>145 | Arg        | Ser        | Asn        | Gln        | Phe<br>150 | Ala        | Phe        | Ala        | Val        | Asp<br>155 | Ser        | Ser        | Ser        | Asn         | Lys<br>160 |
| Arg        | Leu        | Lys        | Pro        | Ser<br>165 | Ser        | Ser        | Pro        | Asp        | Ser<br>170 | Met        | Val        | Thr        | Ser        | Pro.<br>175 | Ser        |
| Pro        | Ala        | Gly        | Val        | Ile        | Gly        | Thr        | Thr        | Val<br>185 | Thr        | Thr        | Val        | Thr        | Glu<br>190 | Ser         | Thr        |
| Arg        | Pro        | Leu<br>195 | Ile        | Leu        | Val        | Asp        | Ser<br>200 |            | Asp        | Asn        | Gly        | Val<br>205 | Arg        | Leu         | Val        |
| His        | Ala<br>210 | Leu        | Met        | Ala        | Cys        | Ala<br>215 | Glu        | Ala        | Val        | Gln        | Ser<br>220 | Ser        | Asn        | Leu         | Thr        |
| Leu<br>225 | Ala        | Glu        | Ala        | Leu        | Val<br>230 | Lys        | Gln        | Ile        | Gly        | Phe<br>235 | Leu        | Ala        | Val        | Ser         | Glr<br>240 |

Ala Gly Ala Met Arg Lys Val Ala Thr Tyr Phe Ala Glu Ala Leu Ala Arg Arg Ile Tyr Arg Leu Ser Pro Pro Gln Thr Gln Ile Asp His Ser Leu Ser Asp Thr Leu Gln Met His Phe Tyr Glu Thr Cys Pro Tyr Leu Lys Phe Ala His Phe Thr Ala Asn Gln Ala Ile Leu Glu Ala Phe Glu Gly Lys Lys Arg Val His Val Ile Asp Phe Ser Met Asn Gln Gly Leu Gln Trp Pro Ala Leu Met Gln Ala Leu Ala Leu Arg Glu Gly Gly Pro Pro Ser Phe Arg Leu Thr Gly Ile Gly Pro Pro Ala Ala Asp Asn Ser Asp His Leu His Glu Val Gly Cys Lys Leu Ala Gln Leu Ala Glu Ala Ile His Val Glu Phe Glu Tyr Arg Gly Phe Val Ala Asn Ser Leu Ala Asp Leu Asp Ala Ser Met Leu Glu Leu Arg Pro Ser Glu Thr Glu Ala Val Ala Val Asn Ser Val Phe Glu Leu His Lys Leu Leu Gly Arg Thr Gly Gly Ile Glu Lys Val Phe Gly Val Val Lys Gln Ile Lys Pro Val Ile Phe Thr Val Val Glu Glu Glu Ser Asn His Asn Gly Pro Val Phe 

Leu Asp Arg Phe Thr Glu Ser Leu His Tyr Tyr Ser Thr Leu Phe Asp 460 455 450 Ser Leu Glu Gly Ala Pro Ser Ser Gln Asp Lys Val Met Ser Glu Val 475 480 470 465 Tyr Leu Gly Lys Gln Ile Cys Asn Leu Val Ala Cys Glu Gly Pro Asp 490 485 Arg Val Glu Arg His Glu Thr Leu Ser Gln Trp Ser Asn Arg Phe Gly 505 510 500 Ser Ser Gly Phe Ala Pro Ala His Leu Gly Ser Asn Ala Phe Lys Gln 515 Ala Ser Thr Leu Leu Ala Leu Phe Asn Gly Gly Glu Gly Tyr Arg Val 540 530 535 Glu Lys Asn Asn Gly Cys Leu Met Leu Ser Trp His Thr Arg Pro Leu 555 550 545 Ile Thr Thr Ser Ala Trp Lys Leu Ser Ala Val His 565 5 <210> <211> 6 <212> PRT Artificial Sequence <213> <220> Synthetic Peptide <223> <220> MISC FEATURE <221> <222> (3)..(3)Xaa = Arg or Asn<223> <400> Gly Tyr Xaa Val Glu Glu

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\langle 223 \rangle Xaa = Arg or Asn
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<223> Xaa = any basic amino acid
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                5
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